From the agricultural point of view the climates of California may be classified as follows: (1) Coast climate, (2) valley climate (including foothill climate), and (3) mountain climate. In brief, the characteristics of the coast climate are equable temperature, increasing as one approaches the south; relatively cool summers and relatively warm winters, compared with the interior; abundant rainfall, increasing as one approaches the north; prevailing west winds; and a humid atmosphere, with frequent fogs and overcast skies. The valley climate is one of higher summer and lower winter temperatures than that of the coast, with little north and south differences; high afternoon temperatures in summer and occasional early morning frosts in winter; abundant rainfall in the north and decreasing rapidly toward the south, necessitating irrigation in the interior valleys of the southern half of the State; dry air; almost constant sunshine, with freedom from fogs and from dew in summer time; and with winds occasionally stormy and cold in winter, and hot and desiccating in summer. The foothills include places up to 2,500 feet in elevation. The foothill climate differs from the valley climate principally in the lower midday temperatures in summer, fewer frosts in winter, and a slightly higher annual rainfall, the same increasing regularly with increase of height above sea level. The valley and foothill regions together form the principal agricultural portions of the State. The mountain climate resembles somewhat that of the Eastern States, and is characterized by moderately warm summers and moderately cold winters, without great temperature ranges, however; abundant precipitation, which increases up to a height of 6,500 feet, and decreases beyond that point; and with much of the winter precipitation in the form of snow, the heaviest known in the United States, and one of the principal resources of the State in that it furnishes, upon melting, most of the water used for irrigation and power purposes.

Of the various agricultural activities in the State horticulture is one of the leading, and its importance is increasing year by year. From the point of view of the horticulturist the chief characteristics of California climate are (1) abundance of sunshine, (2) freedom from extremely low temperatures, and (3) an atmosphere with a low per cent of humidity. Temperature is of prime importance in fruit-growing, since not only must the mean annual temperature be sufficiently high but the mean temperature of the various seasons must also be favorable, and there must be no extremely low temperatures at any time. Sunshine is to be considered, since direct and not diffused sunshine is necessary for fructification. Moreover, a considerable amount is needed for ripening some fruits, and still more is necessary for their curing and preserving. In California the humidity, both absolute and relative, is high in winter and low in summer, just the reverse of that in the East. The dry air of summer not only favors the access of light and heat, but it also permits certain chemical actions necessary for fruit ripening. Moreover, a consideration of some moment is the fact that it prevents certain fungoid diseases. The horticultural year begins with the blossoming of the almond trees in January, an event which marks the advent of spring in California. The period of greatest fruit growth is from June to October. The rest period in trees and vines just following the gathering of the fruit is a dry season climatically, not a cold season as in the East. While strong winds are not of frequent occurrence in the agricultural portions of California, those which do occur come during the season when the trees are bare. Furthermore, the soil moisture has its origin in the winter rains, when the trees and vines are inactive, but gathering strength for the coming season.

Further theoretical considerations are unnecessary. Perhaps the best evidence of the favorable characteristics of California climates is seen in the variety, size, quality, quantity, color, and aroma of its fruit. Again using the exact words of Prof. Wickson, "All things considered, it is doubtful whether any area in the world excels California in possession of natural adaptation to fruit production and preservation."

CLASSIFICATION OF AMERICAN SUMMERS.

By HENRY F. ALCIATORE, Section Director.

[Dated: Local Office, Weather Bureau, Reno, Nev., Aug. 17, 1915.]

Climatologies abound, in which the effects of the weather on growing crops, stock raising, irrigation, etc., are set forth at great length and explained, but where can one find a work that deals exclusively with human aspects of climate, such, for instance, as personal comfort and agreeableness, not to mention exhilarating and debilitating characteristics?[1]

Weather Bureau men are sometimes consulted as to the desirability of this or that climate by people interested in but one phase of the subject, namely, How will the climate affect my physical condition and well being?

Should one desire to compare the climate of one place with that of some other place, how would one go about it? Every climatologist knows that expressions like "Mean annual temperature," "Mean annual humidity," are practically meaningless in comparative climatology. To illustrate: The mean annual temperature of Los Angeles and Little Rock are the same, i. e., 62°F., from which circumstance the reader might infer that, so far as temperature is concerned, the two cities have similar climates. Yet it would be difficult to find two more *dissimilar* climates in the Western Hemisphere. Again, Reno and Des Moines have equal mean annual temperatures, but Reno's summers are considerably cooler and more agreeable than are those of Des Moines, and its winters much milder.

Of course, there is the Angot method of comparing the summers and winters of different places. While it is far more satisfactory than the customary "mean temperature" method, still it falls short of satisfactoriness in that it discusses but one climatic element, namely, the deviation of maximum temperatures above an arbitrarily fixed point (87°F.), and minima below 32°F. Obviously, such a scheme is inadequate to express the contrast between the summer climates of Atlantic City, N. J., and Denver, Colo.; their mean summer temperatures are practically the same, but the first named is one of the dampest spots in the country (in summer) while Denver has a dry summer climate. Nor would the Angot method give good results in the case of Phoenix, Ariz., and Fresno, Cal.; both of these cities are practically in the same class as to excessively high day temperatures, but Fresno's nights are cooler and fairly pleasant. We all know that a summer's day in Washington, D. C., when the thermometer registers 90°F., is quite a

[1] The following are a few among many works that discuss this subject:
Ward, R. DeC. Climate considered especially in relation to Man. London, 1908.
Bebber, W. J. van. Hygienische Meteorologie. Stuttgart, 1895.
Ratzel. Anthropogeographie. Stuttgart, 1899.
Die Erde und das Leben. Leipzig, etc., 1901. 2 v.
Vincent, J. Nouvelles recherches sur la température climatologique. Annales météorol. de l'Observ. roy. de Belgique. N. S., Ann. météorol. t. 20, fasc. 1.—C. A. jr.

different matter from a day with an equal temperature in Reno; in the first-named city the day would be felt as very warm, sticky, and depressing, while in Reno the weather (owing to dryness) would *feel* moderately warm and not at all uncomfortable.

Climatic elements.—In any method of classifying summers, at least three climatic elements should be considered and each given its proper weight, namely, (1) Frequency of showers; (2) temperature; (3) humidity. The nomenclature employed in expressing these elements should be uniform and free from technical terms.

Summer is, par excellence, the open-air, out-of-door, season. Various activities of a social and health-seeking character spring into life with the return of warm weather—riding and boating parties, picnics and lawn fêtes, Olympic games, etc. In most of these success or failure, enjoyment or disappointment, depend not at all on the probable mean temperature of the festal day; the things that count most are: Will it rain? Is it going to be hot or cool? And, where the projected festivities are to last several days, the consideration of paramount importance is this: What is the average percentage of showeriness for that particular period?

TERMINOLOGY.

For the benefit of those who have to make arrangements for outdoor affairs, as well as for people who are contemplating a change of climate for health reasons or personal comfort, the writer suggests the following as a humanized method of classification of summers, in the hope that it may prove useful and create a greater interest in the subject.

This method takes into account the three climatic elements previously referred to. The numerical values chosen are not at all arbitrary, but are based on personal experience, and have been adopted only after the writer had made a rather exhaustive comparison of a score of typical climates in which, at one time or another, he has lived. Other than convenience, brevity, and uniformity of vocabulary, no claims are made for the method. For describing any summer climate whatever not more than ten ordinary English words and two numerals are sufficient.

Character of the summer.—Only two general heads are needed, i. e., Fair and Showery. However, anticipating possible objections to so sharp a division, it has occurred to the writer to add a numerical suffix expressing the percentage of *fair* days in the first and the percentage of *rain frequency* in the second division. I have found that, on the average, the percentage of showeriness in the habitable portions of the United States is about 28, i. e., of the 92 days of summer (June, July, August), 28 per cent are showery. Therefore a climate with a smaller percentage would be styled Fair, and one with a larger percentage Showery. There would be no confusion. To illustrate:

Shreveport, Fair 73 per cent; Fresno, Fair 99 per cent; Chicago, Showery 32 per cent; and New Orleans, Showery 48 per cent, would be intelligible.

Temperature.—Instead of using *mean monthly* temperatures it is proposed to use the *summer* means of the daily maximum and daily minimum temperatures, independently, to the end that days and nights may be properly differentiated. Thus, in New York, the mean afternoon temperature of summer is about 80° and the mean night temperature 65°. For San Francisco the values are, respectively, 65° in the daytime and 53° in nighttime. Furthermore, the term "alternately warm and cool" might be used for climates with large daily variabilities in those two elements. Chicago (as to day temperatures) and Red Bluff (as to night temperatures) will serve as examples of this class. In August, 1913, Chicago experienced the following thermic eccentricities in successive daily maxima (not at all uncommon): 95° to 72°, a drop of 23°; 86° to 74°, fall of 12°; 82° to 69°, fall of 13°; 93° to 82°, fall of 11°; 83° to 94°, rise of 11°. At Red Bluff, Cal., during the same month, night temperatures were almost as erratic, as the following will show: 63° to 78° to 87°, showing successive, 24-hour variations of 15° and 9°, respectively; that is, from a cool night to a very warm and, then, an intolerably hot one; others were: 79° to 66°, fall of 13°; 66° to 76°, rise of 10°; 78° to 70°, fall of 8°. These climates are better described (as to heat) by the expressions "alternately warm and cool days" and "alternately warm and cool nights."

Moisture or relative humidity.—Here assume that, in the absence of 24-hour hygrometric observations, the mean relative humidity of summer based on 8 a. m. and 8 p. m., 7 a. m. and 7 p. m., 6 a. m. and 6 p. m., and 5 a. m. and 5 p. m. local-time readings, will answer all practical purposes.[2] The fact that the humidities of Phoenix and Atlantic City are in the ratio of 32 per cent to 86 per cent will stand whether we use the means of hourly observations or those of twice-daily readings. These percentages probably represent the extremes of summer dryness and dampness for the United States. The four divisions into which we propose to classify the moisture factor of climates, i. e., Very dry, Dry, Damp, Very damp, will be based on the semi-daily hygrometric values used by the Weather Bureau.

The vocabulary and its numerical equivalents are given in Table 1.

TABLE 1.—*Proposed climatographic vocabulary.*

CHARACTER OF SUMMER.

Fair, 0 to 28.5 per cent of rainy days.
Showery, 28.6 to 100 per cent of rainy days.

DAY TEMPERATURE.	°F.
Very cool	50 to 75
Cool	76 to 85
Warm	86 to 94
Hot	95 to 125

NIGHT TEMPERATURE.	
Very cool	35 to 55
Cool	56 to 65
Warm	66 to 70
Hot	71 to 85

RELATIVE HUMIDITY.	Per cent.
Very dry	0 to 45
Dry	46 to 65
Damp	66 to 75
Very damp	76 to 100

Provided with a vocabulary and the necessary climatic data[3] we may now proceed to test our method by classifying ten different summer climates, each one of which shall typify some particular climatic condition and at the same time acquaint the reader with some of the amazing contrasts of summer climates in the United States. That

[2] This assumption seems altogether too violent. The apparent necessity for it in dealing with United States data is regrettable.—C. A., jr.
[3] *Henry, Alfred Judson.* Climatology of the United States. Washington, 1906. (Weather Bureau, Bul. Q.)

this may be done in an orderly fashion I shall group these typical climates in the following order:

Driest.
Dampest.
Hottest days.
Hottest nights.
Coolest days.
Coolest nights.
Most sunshiny.
Most showery.
Variable day temperatures.
Variable night temperatures.

TABLE 2.—*Typical American summer climates described in Alciatore's terminology.*

Modena, Utah	Fair	86 per cent warm days.	Very cool nights	Very dry.
Atlantic City, N. J.	Showery	32 per cent cool days.	Cool nights	Very damp.
Phoenix, Ariz.	Fair	87 per cent hot days.	Hot nights	Very dry.
Galveston, Tex.	Showery	29 per cent warm days.	Hot nights	Very damp.
San Francisco Cal.	Fair	97 per cent very cool days.	Very cool nights	Very damp.
Reno, Nev	Fair	91 per cent cool days.	Very cool nights	Very dry.
Fresno, Cal	Fair	99 per cent hot days.	Cool nights	Very dry.
New Orleans, La.	Showery	48 per cent warm days.	Hot nights	Very damp.
Chicago, Ill	Showery	32 per cent alternately warm and cool days.	Cool nights	Damp.
Red Bluff, Cal	Fair	95 per cent warm days.	Alternately warm and cool nights.	Very dry.

That the reader may judge for himself as to the merits or demerits of the method, I give in Table 3 the weather, temperature, and humidity data which governed me in classifying the climates of the 10 cities named in Table 2.

TABLE 3.—*Data underlying the classification of Table 2.*

	Character of summer.	Temperature, summer means.		Humidity, summer means.	
		Maximum.	Minimum.	A. M.	P. M.
		° F.	*° F.*	*Per ct.*	*Per ct.*
Modena, Utah	86 per cent fair	86	52	42	21
Atlantic City, N. J	32 per cent showery	76	64	84	87
Phoenix, Ariz	87 per cent fair	102	74	45	19
Galveston, Tex	29 per cent showery	88	78	82	75
San Francisco, Cal	97 per cent fair	65	53	91	76
Reno, Nev	91 per cent fair	83	50	62	25
Fresno, Cal	99 per cent fair	96	62	54	16
New Orleans, La	48 per cent showery	88	75	82	73
Chicago, Ill	32 per cent showery	77	63	74	69
Red Bluff, Cal	95 per cent fair	93	64	52	21
Shreveport, La	73 per cent fair	92	72	42	21

Table 3 presents many interesting features of our summer climates. For instance, on first thought the average reader would probably put Shreveport and Galveston in the same class. Note, however, that while the days are warmer in Shreveport the nights are cooler. The delightful coolness of San Francisco's days and nights are brought out in strong relief, but so is its excessive humidity. While Phoenix and Fresno are practically of a kind as to hot days, yet Fresno's nights are far more pleasant. The New Yorker (going outside the table) who spends his summers in Atlantic City may look for cooler afternoons, but the nights will not seem appreciably cooler, as New York has a mean summer minimum of 65°. The summer in Asheville, N. C., is cool (mean maximum, 82°; minimum, 60°) because it is showery (40 per cent); and, by the way, its dampness is almost as pronounced as that of San Francisco, i. e., 83 per cent. The heat of the day is practically the same in New Orleans and Galveston, but the nights are somewhat cooler in New Orleans. Reno and Denver differ but little as to daytime temperatures, yet Reno's nights are appreciably cooler. It is as warm, as a rule, in St. Louis during the daytime at it is in Modena, but their nights are not at all in the same class, Modena's being something like 17° cooler. Portland, Oreg., and Chicago, though in the same division in regard to maximum temperatures, differ materially at night; Chicago is the warmer place by nearly 10°.

The writer hopes, in conclusion, that this paper may elicit a free and vigorous expression of opinion from climatologists and laymen as to the practicability and adequacy of this method for classifying American summers.

BEACH FOG AND FRACTO-CUMULUS.

Mr. F. D. Young, assistant observer at Portland, Oreg., sends us the following notes of a phenomenon which is not unusual but is not often described:

At Garibaldi Beach, near Tillamook, Oreg., the shore is very straight for a distance of 8 or 10 miles and along this whole stretch its inclination is very slight, so that the area of sand uncovered by the receding tide is great.

On August 15, 1915, a very steady wind was blowing from the north, directly along the beach. There were no clouds in the sky, and while the sun was shining brightly the day was agreeably cool. As the tide receded, it was noticed on looking up the beach that there was a bluish white haze above the wet sand that very nearly obscured objects a mile away. Away from the beach, on the ocean and on the land, the air was still very clear. This haze had the appearance of smoke, and the writer walked up the beach expecting to find the driftwood burning. After a mile walk up the beach, however, it was realized that it was not smoke but light fog. On looking closely the vapor could be distinctly seen rising from the wet beach.

About 11 a. m., when the tide had receded some distance, the haze disappeared and a long row of fracto-cumulus clouds appeared in a narrow strip directly above the beach, stretching out of sight in either direction. They were at a very low altitude, probably about 300 or 400 feet. Except for a few cirro-cumulus clouds on the western horizon, the remainder of the sky was clear and the air was without a suggestion of haze in any direction.

NOTES AT HONOLULU, HAWAII, DURING SOLAR ECLIPSE OF AUGUST 10, 1915.

By WILLIAM W. WYATT, Assistant.

[Dated: Weather Bureau, Honolulu, Hawaii, Aug. 24, 1915.]

The annular eclipse of the sun on August 10, began at 10:36 a. m. and ended at 1:53 p. m., 157° 30′ Meridian Time, as given by the Observatory of the College of Hawaii.

Of the phenomena attending the eclipse the most interesting was the cloud formation, especially the upper clouds, which are seen here only occasionally. At 10 a. m. the only clouds visible were a few of the constantly present cumulus hanging over Mount Tantalus.

The air was very moist and the reduction in temperature resulting from the cutting off of the sunlight was sufficient to cause the formation of the upper clouds. Cirri began to form at 12:05 p. m. and were very thin